

AMENDMENTS TO THE CLAIMS

Claims 1-3 (Canceled)

- Claim 4 (Withdrawn)** A reactor system comprising:
- a reactor for producing an aromatic carboxylic acid and water from an alkyl aromatic compound in a solvent containing acetic acid, and for generating a vapor mixture of a solvent and water;
- a first separation membrane for separating said vapor mixture, which is discharged from said reactor, into a first permeable vapor mainly comprising a first component and a first nonpermeable vapor mainly comprising a second component;
- a second separation membrane for separating said first permeable vapor, which is discharged from said first separation membrane, into a second permeable vapor mainly comprising the first component and a second nonpermeable vapor mainly comprising the second component; and
- a return passage for condensing said first nonpermeable vapor and said second nonpermeable vapor and returning the thus condensed first and second nonpermeable vapor into said reactor.

Claim 5 (Withdrawn) The reaction system of claim 4 wherein said solvent containing acetic acid is acetic acid, said alkyl aromatic compound is paraxylene, and said aromatic carboxylic acid is terephthalic acid.

Claim 6 (Withdrawn) The reactor of claim 4 further comprising gas-liquid separators each provided between one of said first and second separation membranes and said return passage for separating terephthalic acid from said first and second nonpermeable vapors.

Claims 7-19 (Canceled)

Claim 20 (New) A separation system comprising:

a distillation column into which a mixture of a first component mainly comprising water and a second component mainly comprising nonaqueous substances is supplied;

an overhead vapor supply pipe connected to a top of said distillation column;

first and second branch pipes branched from said overhead vapor supply pipe;

a superheater connected to said first branch pipe;

a separator provided downstream of said superheater and including a separation membrane for separating overhead vapor discharged from the top of said distillation column into a permeable vapor which mainly comprises said first component and a nonpermeable vapor which mainly comprises said second component by allowing only a selected portion of said overhead vapor to permeate said separation membrane; and

a reflux unit comprising a condenser connected to said second branch pipe for cooling a portion of said overhead vapor into a liquid and a gas-liquid separator for separating gas from the liquid produced by cooling in said condenser and returning the thus separated liquid into the top of said distillation column.

Claim 21 (New) The separation system of claim 20 wherein said distillation column includes fluidized beds.

Claim 22 (New) The separation system of claim 20 wherein said separation membrane comprises an inorganic porous member comprising a porous ceramic substrate, and a silica gel layer comprising a silica gel membrane carried on the surface of the porous ceramic substrate or in the pores of the porous ceramic substrate.

Claim 23 (New) A separation system comprising:

a distillation column into which a mixture of a first component mainly comprising water and a second component mainly comprising nonaqueous substances is supplied;

an overhead vapor supply pipe connected to a top of said distillation column;

first and second branch pipes branched from said overhead vapor supply pipe;
a superheater connected to said first branch pipe;

a first separator provided downstream of said superheater and including a first separation membrane for separating overhead vapor discharged from the top of said distillation column into a permeable vapor which mainly comprises said first component and a nonpermeable vapor which mainly comprises said second component by allowing only a selected portion of said overhead vapor to permeate said separation membrane;

a second separator including a second separation membrane for separating said first permeable vapor into a second permeable vapor which mainly comprises said first component and is higher in the concentration of said first component than said first permeable vapor, and a second nonpermeable vapor which mainly comprises said second component, by allowing only a selected portion of said first permeable vapor to permeate said second separation membrane; and

a reflux unit comprising a condenser connected to said second branch pipe for cooling a portion of said overhead vapor into a liquid, and a gas-liquid separator for separating gas from the liquid produced by cooling in said condenser, and returning the thus separated liquid into the top of said distillation column.

Claim 24 (New) The separation system of claim 23 wherein said first and second separation membranes each comprise an inorganic porous member comprising a porous ceramic substrate, and a silica gel layer comprising a silica gel membrane carried on the surface of the porous ceramic substrate or in the pores of the porous ceramic substrate.